

# THE MINERAL INDUSTRY OF SAUDI ARABIA

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In 2004, the Kingdom of Saudi Arabia maintained its position as the leading oil producer in the world. In addition to crude oil, natural gas, and products of processed petroleum and natural gas, such as carbon black, methanol, petrochemicals, refined petroleum products, and sulfur, other mineral and mineral-based commodity production included barite, cement, construction and industrial materials, copper, nitrogenous and phosphatic fertilizers, ferroalloys, gold, granite, lead, salt, silica sand, silver, and zinc. Steel was produced from scrap and imported iron ore pellets. Titanium dioxide pigment was produced from imported rutile (U.S. Energy Information Administration, 2005a).

Historically, construction projects in the Kingdom were advanced in times of high oil prices and deferred in times of lower oil prices, but with projected sustained demand for oil from China coupled with the effects of supply disruptions, such as the delay in the resumption of significant oil exports from Iraq, oilfield infrastructure damaged by hurricanes in the Gulf of Mexico, strikes in Nigeria, and terrorist attacks in Saudi Arabia, many companies operated under the expectation that high oil prices would continue for a few more years. In 2004, the third consecutive year of increased oil prices resulted in the continuation of a construction boom in Saudi Arabia. Additional proposals were floated for mineral-based commodity projects, especially in the construction-related area, such as cement and steel, and in petrochemicals. In addition to the expenditures of Government-owned companies, which dominated the minerals sector, domestic and international (under the Foreign Investment Act of 2000) investors provided funds for some exploration and production-capacity expansions in the nonfuel minerals sector and in natural gas exploration in the Rub al-Khali (Lidstone, 2004; Tan, 2004).

The International Monetary Fund (2005<sup>1</sup>) estimated that the gross domestic product (GDP) based on purchasing power parity was \$316 billion<sup>2</sup> in 2004 and that the GDP per capita based on purchasing power parity was about \$13,955. The real GDP growth rate was estimated to have increased by 5.2%.

## Government Policies and Programs

In 2004, the Government initiated the proposed privatization of state-owned Saudi Arabian Mining Co. (Ma'aden). Ma'aden's gold mining section was expected to be divested by an initial public offering of shares in 2006.

The Saudi Cabinet approved a new mining investment law in 2004. The new law would eliminate the profit-sharing requirements of the old law and reduce the tax on mining income to 20%. The maximum size of mineral exploration licenses would be reduced to 100 square kilometers (km<sup>2</sup>) from 10,000 km<sup>2</sup>. Licenses offered under the new law included 2-year reconnaissance and material collection licenses, 5-year exploration licenses, 5-year building-materials quarry licenses, 20-year small mine licenses, and 30-year mine and raw materials quarry licenses.

## Trade

In 2004, exports of crude oil and petroleum products from Saudi Arabia to the United States were reported to be about 1.558 million barrels per day (Mbbbl/d). Of this total, about 1.495 Mbbbl/d was crude oil, which accounted for about 14.8% of the United States' crude oil imports and made Saudi Arabia the United States' third ranked source of imported crude oil in 2004 after Canada and Mexico. The United States had imported an average of 1.774 Mbbbl/d of crude oil and petroleum products from Saudi Arabia in 2003. Exports of crude oil to China have tripled in the past 5 years to about 47,000 barrels per day (bbl/d) in 2004 compared with about 15,000 bbl/d in 2000 (U.S. Energy Information Administration, 2005b).

## Commodity Review

### Metals

**Bauxite and Alumina.**—In 2004, work on the feasibility study of the Az Zabirah project was underway for Ma'aden. The Government awarded contracts to design a 1,400-kilometer (km) railroad that would link the Al Jalamid phosphate deposit and the proposed 3.4-million-metric-ton-per-year (Mt/yr)-capacity Az Zabirah bauxite mine to the rail line that passes through Riyadh. The 450-km rail line from Riyadh to Dammam would be renovated, and a spur line would be installed to Ras al-Zhor where Ma'aden proposed building a 1.4-Mt/yr alumina plant (Smith, 2004§).

**Iron and Steel.**—The construction boom resulted in the increased domestic demand for steel in Saudi Arabia. Saudi Iron and Steel Co. (Hadeed) contracted out several projects for its facility at Al-Jubail. Projects included a 1.2-Mt/yr expansion of the electric arc furnace (EAF) plant by a consortium of Siemens AG and Voest Alpine Industrieanlagenbau GmbH. & Co. (VAI); the expansion of

<sup>1</sup>References that include a section mark (§) are found in the Internet References Cited section.

<sup>2</sup>Where necessary, values have been converted from Saudi riyals (SRIs) to U.S. dollars at the rate of SRIs3.75=US\$1.00.

the hot-rolling mill to 2 Mt/yr from 800,000 metric tons per year (t/yr) that the consortium of SMS Demag AG and VAI expected to complete in early 2006; the construction of a 500,000-t/yr bar and wire rod mill that Danieli Morgårdshammar Co. and Dwyidag Saudi Arabia Co., Ltd. expected to complete in early 2006; and the expansion of the direct-reduction iron facility to 1.76 Mt/yr by the consortium of Midrex Technologies, Inc. and VAI (Middle East Economic Digest, 2004f; Midrex Technologies, Inc., 2004; Siemens AG, 2004).

Al-Azizia Steel Co. Ltd. proposed building a 450,000-t/yr-capacity meltshop at Hadda. Al-Yamamah Co. for Reinforcing Steel Bars Ltd. awarded a contract to Danieli Morgårdshammar for a 500,000 t/yr rolling mill that was expected to be operational in 2005. The mill would be designed to produce 8- to 36-millimeter deformed bars. Rajhi Steel Industries awarded the contract to Danieli Centro Met S.p.A. for the construction of a \$253 million 850,000-t/yr steel plant at Jeddah. The plant's 100-metric-ton EAF was expected to start up in late 2005 (Danieli Group, 2004; Metal Bulletin, 2004; Danieli Group, 2004§).

Construction of a 300,000-t/yr-capacity factory for Arabian Pipes Co. was expected to be completed in mid-2005. The plant was designed to manufacture pipes in the 40.7- to 122-centimeter size range (MESteel.com, 2004§).

### **Industrial Minerals**

**Cement.**—The construction boom in Saudi Arabia and the adjacent Gulf region resulted in the significantly increased demand for cement in Saudi Arabia. Domestic companies responded with a number of proposed capacity expansions or new cement lines. Work continued on the 4,500-metric-ton-per-day (t/d) clinker line no. 3, which was located 330 km northwest of Riyadh, for Qassim Cement Co. Commercial production was scheduled to begin in late 2005 (World Cement, 2004).

Arab Cement Co. received bids on the installation of a new 7,000-t/d-capacity cement line at its Rabigh facility. Southern Province Cement Co. awarded the construction contract for a 5,000-t/d-capacity cement clinker plant to Sinoma International Engineering Co., Ltd. of China. Tabuk Cement Co. proposed increasing its cement mill capacity to 260 t/d from 180 t/d (Middle East Economic Digest, 2004b, h, i).

Yamama Saudi Cement Co. Ltd. awarded contracts to Polysius AG and Gama Industry Arabia Ltd. for a 10,000-t/yr-capacity cement line. The new line will be built at Yamama's six-line 9,000-t/d plant near Riyadh. Yanbu Cement Co. Ltd. proposed to increase the capacity of Clinker Line no. 4 to 8,500 t/d from 7,000 t/d and to increase its grinding capacity to 4.2 Mt/yr from 1.4 Mt/yr. Both Yanbu projects were expected to be operational by late 2005 (Middle East Economic Digest, 2004d, j; Middle East North Africa Financial Network, Inc., 2004§).

**Phosphate Rock.**—In 2004, Ma'aden awarded a contract to the SNC Lavalin Group, Inc. of Canada and Jacobs Engineering Group Inc. of the United States for advanced engineering services on the development of the Al-Jalamid phosphate deposit and an associated fertilizer complex at Ras al-Zhor. The Al-Jalamid facility was expected to produce 4.5 Mt/yr of phosphate concentrate from mine output of about 11 Mt/yr of phosphate rock for at least 27 years. Initial production could begin by 2008. The concentrate would be shipped on a new railroad to Ras al-Zhor where Ma'aden proposed to build a 2.9-Mt/yr diammonium phosphate plant. The Kingdom has significant but isolated phosphate rock reserves. The development of transportation infrastructure to the Al-Jalamid area will significantly enhance the feasibility of developing the phosphate resources at Umm Wu'al, which was located about 75 km west of Al-Jalamid. Resources at Umm Wu'al were estimated to be 772 million metric tons with an average grade of 18% phosphorus pentoxide (Middle East Economic Digest, 2004e; Saudi Arabia Directorate General of Mineral Resources, 1994; Saudi Arabian Information Resource, 2004§).

### **Mineral Fuels**

In 2004, hydrocarbon discoveries included the Abu Sidr oilfield, the Midrikah gasfield, and a new gas reservoir in the Shaybah oilfield. Plans to expand the Rabigh oil refinery significantly were advanced in 2004.

The expectation that international interest would be focused on the natural gas exploration activities in Saudi Arabia was dashed after significant international attention was diverted to a controversy that concerned the long-term sustainability of Saudi oil production. Continued high international oil prices sustained the media interest in the dispute, which was primarily expounded by an analyst from the United States, about the production capacity and reserves of Saudi Arabian Oil Co. (Saudi Aramco) (Al-Husseini, 2004; Middle East Economic Digest, 2004a; Takin, 2004; Morton, 2004§; Simmons, 2004§).

**Natural Gas.**—The South Rub al-Khali nonassociated gas exploration joint venture of the Royal Dutch/Shell Group of the Netherlands and the United Kingdom (40% interest), Total SA of France (30%), and Saudi Aramco (30%), completed an airborne gravity survey on its 210,000-km<sup>2</sup> exploration block, which covered almost 11% of Saudi Arabia's 1,960,582-km<sup>2</sup> area. Contracts for exploration for nonassociated gas in the North Rub Al-Khali area were issued for Area A to Lukoil Saudi Arabia Energy Ltd. (Lukar), which was the company formed by OAO Lukoil of Russia (80%) and Saudi Aramco (20%); Area B to Sino Saudi Gas Ltd., which was owned by China Petroleum and Chemical Corp. (Sinopec) (80%) and Saudi Aramco (20%); and Area C to EniRepSa Gas Ltd., which was owned by ENI S.p.A. of Italy (50%), Repsol YPF SA of Spain (30%), and Saudi Aramco (20%). Lukar subsequently awarded a contract to WesternGeco (a joint venture of Baker Hughes Inc. and Schlumberger Ltd.) to shoot 8,750 km of two- and three-dimensional seismic surveys across the 29,900 km<sup>2</sup> Area A (Middle East Economic Digest, 2004c, g).

**Petroleum.**—The Kingdom embarked on a program to increase production capacity to 12.5 Mbbl/d, which would allow Saudi Arabia to maintain 1.5- to 2-Mbbl/d excess production capacity that could offset unexpected international supply disruptions. Initial

projections that much of the new Saudi production capacity would be less marketable high-sulfur-content heavy oil [27° to 29° API on the American Petroleum Institute (API) density scale] were countered by Saudi Aramco's actions. The 800,000-bbl/d Abu Sa'fah/Qatif Field development program was officially commissioned in December. Production from the Abu Sa'fah/Qatif Fields was in the Arab Light (33° to 36° API) range of crude oils. Plans also were made to develop the Abu Hadriyah, the Fadhili, and the Khursaniyah oilfields at an initial rate of 500,000 bbl/d of Arab Medium in 2005 and to produce an additional 300,000 bbl/d of Arab Light from the Haradh Field in 2006. Plans were proposed to redevelop mothballed fields, which included production of about 800,000 bbl/d of Arab Medium from the Khurais Field and 300,000 bbl/d of Arab Heavy from the Manifa Field (Middle East Economic Digest, 2005; Petroleum Economist, 2005).

## Reserves

New crude oil reserves and other reserve additions essentially replaced the volume of reserves that were produced in 2004. Saudi Aramco reported that the country's crude oil reserves were about 259.7 billion barrels and that total natural gas reserves were about 6.7 trillion cubic meters. Most of Saudi Arabian natural gas reserves were associated with the country's oilfields (Saudi Arabian Oil Co., 2005, p. 46).

## Outlook

With the higher oil prices received by the country in 2004, a number of new construction and mineral development projects were proposed; many have been funded and are expected to become operational in 2005 or 2006. The volume of ongoing projects will significantly increase the demand for cement and construction materials in the near term.

The domestic demand for cement has resulted in significantly decreased exports by Saudi cement companies. The sector's expansion to meet local demand coupled with the cyclical nature of construction may result in significant excess cement production capacity in the future especially because former importers of Saudi cement also have begun installation of additional cement capacity to replace the cement that formerly was imported from Saudi Arabia.

The development of alumina production capacity; the ongoing expansion of the Saudi Arabian cement, fertilizer, and steel sectors; the development of additional national railroad infrastructure; and the revised Saudi Gas Initiative will further the Government's economic diversification efforts. Most of the Kingdom's income, however, will remain dependent upon the international oil markets and, thus, be vulnerable to changes in the volume and pattern of worldwide trade in crude oil, petrochemicals, and refined petroleum products.

In 1999, when total (Saudi and non-Saudi) population was estimated to be 19.9 million, the Saudi labor force was 2.8 million and the non-Saudi labor force was 3.0 million. The Saudi unemployment rate was 8.1%. Despite the Government's Saudization program, increased labor force participation resulted in a rise in the unemployment rate in 2004, when the population was estimated to be about 25.8 million. The future demand for manpower by the expanded mineral sector is not expected to be a significant factor in the reduction of the unemployment rate (Bourland, 2002; Samba Financial Group, 2005, p. 2).

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## Major Sources of Information

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TABLE 1  
SAUDI ARABIA: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity <sup>2</sup>	2000	2001	2002 <sup>e</sup>	2003 <sup>e</sup>	2004 <sup>e</sup>
METALS					
Ferroalloys <sup>e</sup>	83,000	78,000	75,000	75,000	85,000
Iron and steel:					
Direct-reduced iron                      thousand metric tons	3,090	2,880	3,290	3,290	3,410
Steel, crude                                              do.	2,973	3,413	3,570	3,944 <sup>3</sup>	3,902 <sup>3</sup>
Ore, mine output:					
Gross weight <sup>e</sup>	1,700,000	2,000,000	2,000,000	2,000,000	2,200,000
Copper content of concentrate and bullion <sup>e</sup>	900	800	800	800	500
Gold content of concentrate and bullion                      kilograms	3,800 <sup>e</sup>	5,000 <sup>e</sup>	4,192 <sup>3</sup>	8,769 <sup>3</sup>	9,000
Lead content of concentrate <sup>e</sup>	50	60	60	60	30
Silver content of concentrate and bullion <sup>e</sup> kilograms	9,300	15,000	14,000	13,000	6,000
Zinc content of concentrate <sup>e</sup>	3,000	3,300	3,000	3,000	1,500
INDUSTRIAL MINERALS					
Barite <sup>e</sup>	8,000	9,000	9,000	9,000	10,000
Cement, hydraulic                      thousand metric tons	18,107	20,608	22,000	23,000	23,200
Fertilizer, phosphatic, P <sub>2</sub> O <sub>5</sub> content <sup>e</sup> do.	147	150	150	150	295
Gypsum, crude <sup>e</sup>	400,000	450,000	450,000	450,000	450,000
Lime <sup>e</sup>	350,000	350,000	350,000	350,000	350,000
Nitrogen:					
N content of ammonia                      thousand metric tons	1,743	1,774	1,737 <sup>3</sup>	1,743 <sup>3</sup>	1,726 <sup>3</sup>
N content of urea                                              do.	1,214	1,260	1,241 <sup>r,3</sup>	1,247 <sup>r,3</sup>	1,242 <sup>3</sup>
Pozzolan <sup>e</sup>	150,000	150,000	150,000	160,000	160,000
Salt <sup>e</sup>	200,000	200,000	220,000 <sup>r</sup>	220,000 <sup>r</sup>	230,000
Sand and gravel <sup>e</sup> thousand metric tons	120,000	120,000	120,000	120,000	150,000
Scoria <sup>e</sup> do.	2,000	2,000	2,000	2,000	2,000
Sulfur, byproduct, hydrocarbon processing	2,101,391	2,350,000 <sup>e</sup>	2,360,000	2,180,000 <sup>r</sup>	2,230,000
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross                                              million cubic meters	54,436 <sup>r</sup>	58,500 <sup>r</sup>	63,978 <sup>r,3</sup>	67,389 <sup>r,3</sup>	75,967 <sup>3</sup>
Dry                                              do.	49,668 <sup>r</sup>	53,689 <sup>r</sup>	57,314 <sup>r,3</sup>	60,060 <sup>r,3</sup>	68,000
Natural gas liquids: <sup>e</sup>					
Propane                                              thousand 42-gallon barrels	163,000	166,000	179,000	190,000 <sup>r</sup>	210,000
Butane                                              do.	69,000	72,000	78,000	90,000 <sup>r</sup>	100,000
Natural gasoline and other                      do.	53,000	54,000	60,000	65,000 <sup>r</sup>	77,000
Total                                              do.	285,008 <sup>3</sup>	292,385 <sup>3</sup>	316,938 <sup>3</sup>	345,100 <sup>r,3</sup>	387,300 <sup>3</sup>
Petroleum:					
Crude oil                                              million 42-gallon barrels	2,962	2,879	2,589 <sup>3</sup>	3,000 <sup>r</sup>	3,151 <sup>3</sup>
Refinery products:					
Liquefied petroleum gases                      thousand 42-gallon barrels	9,634	13,230	10,340 <sup>r,3</sup>	10,150 <sup>r,3</sup>	12,000
Gasoline and naptha                                              do.	155,556	152,230	153,000	171,720 <sup>r,3</sup>	185,000
Jet fuel and kerosene                                              do.	66,920	60,050	59,700	65,550 <sup>r,3</sup>	70,000
Distillate fuel oil                                              do.	198,176	193,770	193,000	215,590 <sup>r,3</sup>	225,000
Residual fuel oil                                              do.	163,941	169,530	158,000	169,380 <sup>r,3</sup>	190,000
Unspecified <sup>4</sup> do.	8,083	8,650	9,180	10,240 <sup>r,3</sup>	10,000
Total                                              do.	602,310	597,460	583,000	642,630 <sup>r,3</sup>	692,000

<sup>e</sup>Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. <sup>r</sup>Revised.

<sup>1</sup>Table includes data available through October 2005.

<sup>2</sup>In addition to commodities listed, the following were produced: basalt, carbon black, clays, granite, limestone, marble, methanol, and silica sand; available information is inadequate to estimate output.

<sup>3</sup>Reported figure.

<sup>4</sup>Includes asphalt.